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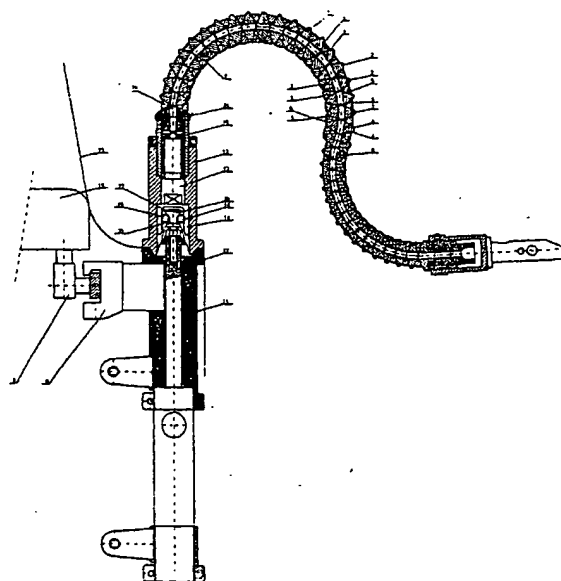
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(54) Title: SUPPORTING ARM FOR SURGICAL PURPOSES



(57) Abstract: The invention relates to a supporting arm for surgical purposes, comprising a base suitable for placing on a stable basis such as a rail of an operating table, and a distal end with a clamp or the like for keeping an instrument (i.e. a surgical instrument) in position, wherein the arm comprises a manipulative position in which the arm is adjustable to a predetermined position, and a fixing position in which the arm is rigid so that the distal end of the arm provides a fixed position for the surgical instruments.



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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## Supporting arm for surgical purposes

The invention relates to a supporting arm for surgical purposes, comprising a base suitable for placing  
5 on a stable basis such as a rail of an operating table, and a distal end with a clamp or the like for keeping an instrument, in particular a surgical instrument, in position.

A need for such a supporting arm has existed for  
10 a long time. In the international patent application WO 97/10753 such a supporting arm for surgical purposes is used for the stable positioning of particular surgical instruments during open-heart surgery. This international patent application makes reference to such a supporting  
15 arm in general terms.

A supporting arm of this kind conforming to the preamble of the main claim is known from US-A-5,899,425. This supporting arm comprises a manipulative position in which the arm is adjustable to a predetermined position,  
20 and a fixing position in which the arm is rigid so that the distal end of the arm provides a fixing position for the surgical instruments. The surgeon is thus able to move the arm to the desired position, after which he activates the fixing position of the arm with which the desired stable  
25 position for the surgical instruments is realized.

According to the invention, an embodiment that proved to be very convenient for realizing this is characterized in that the arm comprises joining disk-like bodies interposed with annular bodies, the adjacent disk-like  
30 bodies and annular bodies being capable of a slight radial movement in relation to one another. The mutual movability of the disk-like bodies and the annular bodies allows the surgeon during use to adjust the form of the arm according to his requirements, and in this connection, to position  
35 the distal end of the arm as required. This greatly improves the accessibility of the actual operating field,

since obstructions caused by the form of the arm can be avoided.

For the stability of the arm it is desirable that the disk-like bodies be embodied with wall surfaces tapering radially convergent and that the annular bodies be embodied with wall surfaces tapering radially divergent and substantially abutting to the adjacent wall surfaces of the disk-like bodies.

In a further aspect of the invention, the disk-like bodies and the annular bodies are provided with a central bore accommodating a tension cable. The degree of force exerted on the tension cable effectuates the adjustment between the manipulation position and the fixed position of the supporting arm.

It is further advantageous that the arm is made up of components including a bottom part which comprises the base, and a removable top part that can be placed on the bottom part, and which includes the articulated portion, with the proximal end of the top part comprising a coupling organ connected with the tension cable, and which coupling organ may be coupled with a tensioning member comprised in the bottom part. This makes it possible to arrange the bottom part of the supporting arm coupled to, for example, a fastening rail of the operating table, under the operating sheet, while the top part of the supporting arm can be sterilized and positioned above the operation sheet. The tensioning member incorporated in the component is operable preferably by means of a control member placed on the floor, with which a hydraulic tensioning jack can be activated to tighten the tensioning member and thus, via the coupling organ, the tensioning cable.

It is useful, among other things for the control convenience, for the top part to be provided with a handle for operating a locking organ that couples the top part to the bottom part, and which locking organ also couples the tensioning organ with the coupling organ.

A suitable embodiment of the supporting arm is further characterized in that the locking organ is embodied as a two-pronged fork, in that the tensioning organ has a mushroom-shaped end comprising a stem and a widening head, and in that by operating the handle, the prongs of the fork are positioned at either side of the stem and underneath the head, the prongs of the fork effecting a clamp coupling with a sleeve-like end of the coupling organ in which the mushroom-shaped end of the tensioning organ is accommodated.

The invention will now be explained in more detail with reference to a non-limiting exemplary embodiment, in which

Figure 1 shows a schematic cross section of the supporting arm according to the invention near the coupling to the operating table; and

Figure 2 is a representation of Figure 1 turned 90° and shows a detail of the supporting arm according to the invention in the vicinity of where the top part is placed on the bottom part of the supporting arm.

Similar parts in the Figures carry identical reference numbers.

Referring first to Figure 1, the supporting arm 1 according to the invention is partially shown in a schematic cross-sectional view. Figure 1, shows in particular that the arm 1 has an articulated portion comprising joining disc-like bodies 2, and annular bodies 3 interposed between the disk-like bodies 2, the adjacent disk-like bodies 2 and annular bodies 3 being capable of a slight radial movement in relation to one another. This makes it possible for the articulated portion of the arm 1 to be moved into any position desired. Figure 1 further shows that the disk-like bodies 2 are embodied with wall surfaces 4 tapering radially convergent and that the annular bodies 3 are embodied with wall surfaces 5 tapering radially divergent, and which substantially abut to the wall surfaces 4 of adjacent disk-like bodies 2. Figure 1 further shows that the disk-like bodies 2 and the annular

bodies 3 are provided with a central bore 6 accommodating a tensioning cable 7.

Figure 1, further shows that the supporting arm comprises a base 8, which allows the supporting arm to be placed on a stable basis such as a rail 9 of the operating table 10. It is also shown that the arm 1 is made up of components including a bottom part 11 which comprises the base 8 and a removable top part 12 that can be placed on the bottom part 11 and which includes the articulated portion. Figure 1 further shows the operating sheet 23 between the bottom part 11 and the top part 12 of the supporting arm 1. The whole of the top part 12 can be sterilized. The proximal end of the top part 12 comprises a coupling organ 13 with which the tensioning cable 7 is connected. Said tensioning cable 7 is not shown, but to the person skilled in the art it will be obvious that the same extends through the feed-through aperture 14 of the element indicated with reference number 24, to which the disk-like bodies 2 and the annular bodies 3 are connected. The tensioning cable 7 terminates in the shoe 15 and is permanently coupled thereto. The shoe 15 is part of the coupling organ 13, and is in turn permanently connected with the sleeve like end 16, to be discussed later, of the coupling organ 13. In a manner also to be discussed later, the coupling organ 13 can be coupled to a tensioning organ 17, which in this case is a tensioning rod coupled with a hydraulic jack, comprised in the bottom part 11.

The positioning and coupling of the top part 12 on the bottom part 11 will now be elucidated with reference to Figure 2. Said Figure 2 shows that the top part 12 is provided with a handle 18 for operating a locking organ 19 securing the coupling of the top part 12 to the bottom part 11, and which locking organ 19 also couples the tensioning organ 17 with the coupling organ 13. Figure 2, shows a cross-sectional view rotated 90° with regard to Figure 1. As can be clearly seen from Figure 1, the locking organ 19 is embodied as two-pronged fork, while the tensioning organ 17 has a mushroom-shaped end 20 compris-

ing a stem 21, and a widened head 22, so that by operating the handle 18, the prongs of the fork 19 are positioned at either side of the stem 21 and underneath the head 22. The prongs of the fork 19 simultaneously produce a clamping

5 coupling (see Figure 1) with the sleeve-like end 16 of the coupling organ 13 in which the mushroom-shaped end 20 of the tensioning organ 17 is accommodated. When the handle 18 is operated and moved from the position indicated with A in Figure 2 to the position indicated with B, the top

10 part 12 is coupled with the bottom part 11 and the tensioning organ 17 is connected with the coupling organ 13. Activation of the tensioning organ 17 causes the mushroom-shaped end 20 to be moved downwards with the result that the sleeve-like end 16 of the coupling organ 13 and the

15 shoe 15 which is part of the coupling organ 13, are also moved downward. This downwards movement causes the tensioning cable that is permanently coupled with the shoe 15, to be tightened, so that the supporting arm 1 is brought into the manipulative position or the fixed position, respectively, in accordance with what is requisite

20 and depending on the tensioning force exerted.

CLAIMS

5           1. A supporting arm (1) for surgical purposes,  
comprising a base (8) suitable for placing on a stable ba-  
sis such as a rail (9) of an operating table (10), and a  
distal end with a clamp or the like for keeping an instru-  
10 arm (1) comprises a manipulative position in which the arm  
is adjustable to a predetermined position, and a fixing  
position in which the arm (1) is rigid so that the distal  
end of the arm provides a fixed position for the surgical  
instrument, **characterized** in that the arm (1) comprises  
15 joining disk-like bodies (2) interposed with annular bod-  
ies (3), the adjacent disk-like bodies (2) and annular  
bodies (3) being capable of a slight radial movement in  
relation to one another.

          2. A supporting arm according to claim 1, **charac-**  
20 **terized** in that the disk-like bodies (2) are embodied with  
wall surfaces (4) tapering radially convergent and that  
the annular bodies (3) are embodied with wall surfaces (5)  
tapering radially divergent and substantially abutting to  
the adjacent wall surfaces (4) of the disk-like bodies  
25 (2).

          3. A supporting arm according to claim 1 or 2,  
**characterized** in that the disk-like bodies (2) and the an-  
nular bodies (3) are provided with a central bore (6) ac-  
commodating a tension cable (7).

30           4. A supporting arm according to one of the pre-  
ceding claims, **characterized** in that the same is made up  
of components including a bottom part (11) which comprises  
the base (8), and a removable top part (12) that can be  
placed on the bottom part (11), and which includes the ar-  
35 ticulated portion, with the proximal end of the top part  
(12) comprising a coupling organ (13) connected with the  
tension cable (7), and which coupling organ may be coupled



with a tensioning member (17) comprised in the bottom part (11).

5. A supporting arm according to claim 4, characterized in that the top part (12) is provided with a handle for operating a locking organ (19) that couples the top part (12) to the bottom part (11), and which locking organ (19) also couples the tensioning organ (17) with the coupling organ (13).

6. A supporting arm according to claim 5, characterized in that the locking organ (19) is embodied as a two-pronged fork, in that the tensioning organ has a mushroom-shaped end (20) comprising a stem (21) and a widening head (22), and in that by operating the handle (18), the prongs of the fork (19) are positioned at either side of the stem (21) and underneath the head (22), the prongs of the fork (19) effecting a clamp coupling with a sleeve-like end (16) of the coupling organ (13) in which the mushroom-shaped end (20) of the tensioning organ (17) is accommodated.

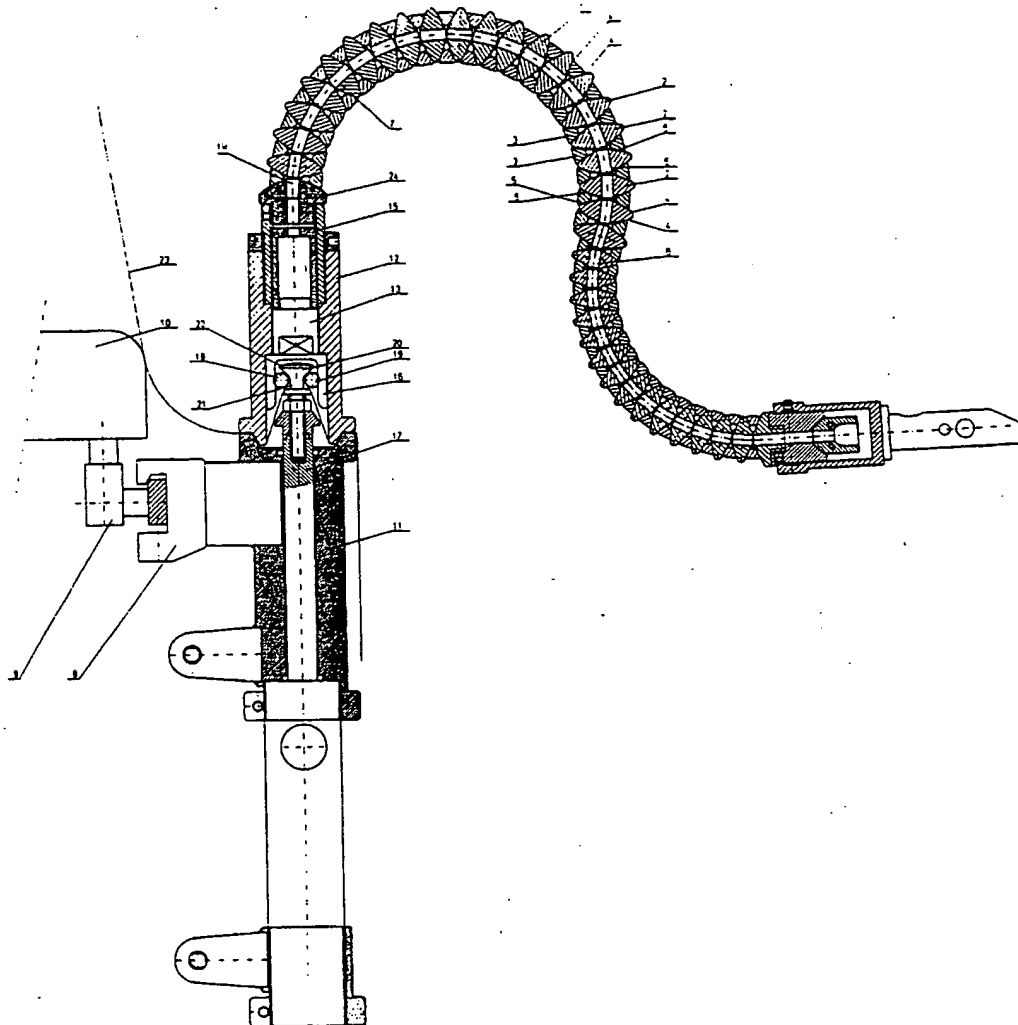


FIG. 1

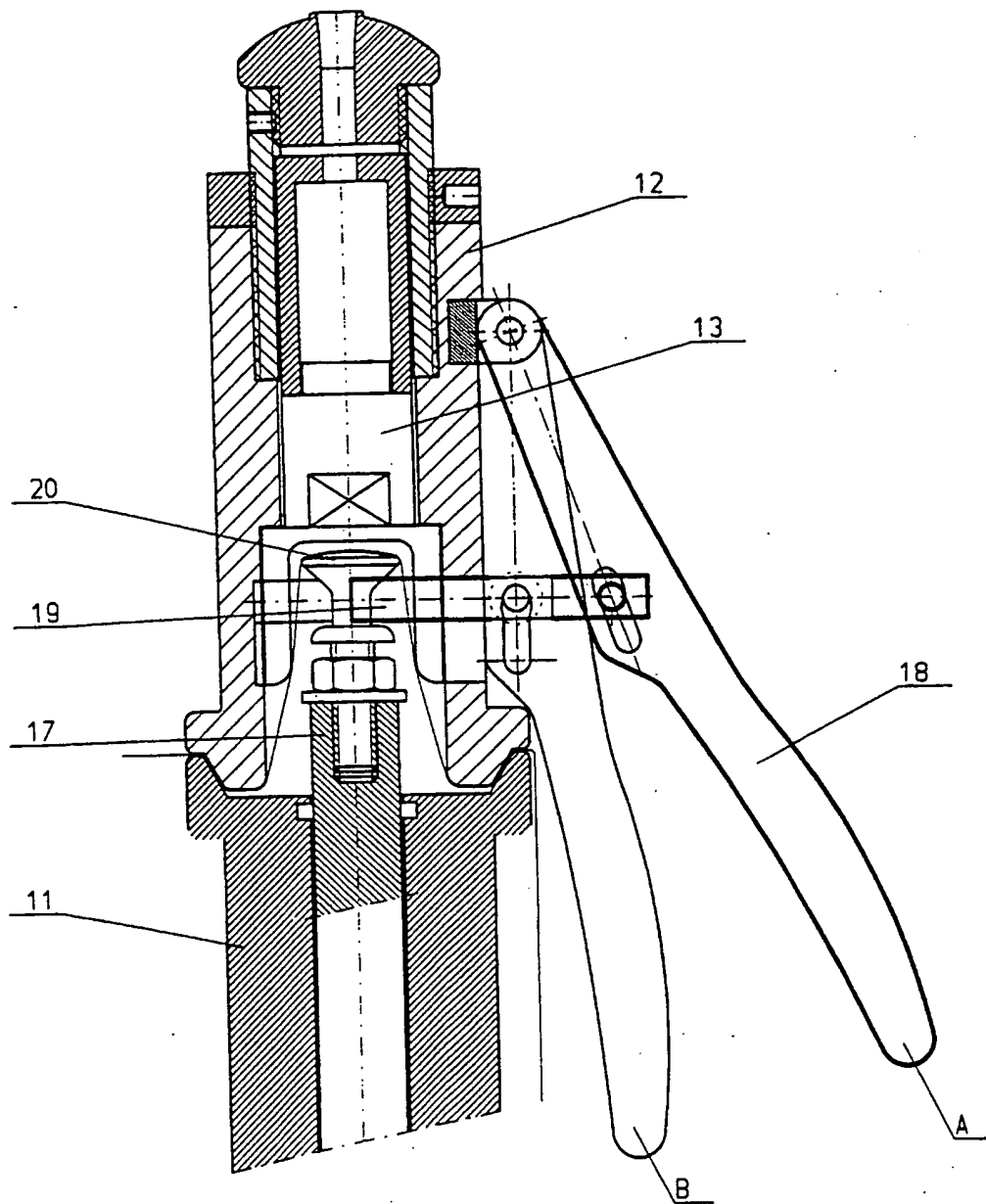


FIG. 2

# INTERNATIONAL SEARCH REPORT

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<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC 7 A61B19/00 F16M11/40		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC 7 A61B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 983 560 A (POLYMATHIC ENGINEERING COMPANY) 17 February 1965 (1965-02-17)	1-3
Y	page 1, column 2, line 78 -page 2, column 2, line 74; figure 2	4,5
A	US 5 513 827 A (MICHELSON GARY K) 7 May 1996 (1996-05-07)	1
Y	abstract; figures 1,4	4,5
A	US 5 899 425 A (COREY JR EDMUND R ET AL) 4 May 1999 (1999-05-04)	1-4
	column 3, line 17 -column 4, line 48; figures 1,2	
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
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Date of the actual completion of the international search 28 May 2001		Date of mailing of the international search report 12/06/2001
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040. Tx. 31 651 epo nl. Fax: (+31-70) 340-3016		Authorized officer Moers, R

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 01/00044

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>WO 97 10753 A (MEDTRONIC INC ;BORST CORNELIUS (NL); MANSVELT BECK HENDRICUS J (NL) 27 March 1997 (1997-03-27) cited in the application page 20, line 27 -page 22, line 6; figures 31,32</p> <p>-----</p>	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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